Paper No. 36

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FUSEN E. CHEN, FU-TAI LIOU and CHE-CHIA WEI

Appeal No. 1997-3769
Application 08/418,257

ON BRIEF

Before KRASS, MARTIN and JERRY SMITH, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1, 3-11 and 18-28, all of the claims pending in the application.

The invention pertains to a method for forming a metal contact in an integrated circuit. More particularly, an improved interlevel contact is said to be achieved by

improving the

coverage in contact vias through the manner in which aluminum is deposited therein.

Representative independent claim 1 is reproduced as follows:

1. A method for forming an aluminum contact in an integrated circuit, comprising the steps of:

forming an insulating layer over a conducting layer;

forming an opening through the insulating layer to expose a portion of the conducting layer;

forming a layer including a refractory metal over the insulating layer, and sidewalls and a bottom of the opening;

raising the temperature of the integrated circuit from below approximately 350EC to a value between approximately 400EC and approximately 500EC;

during said step of raising the temperature, beginning to deposit aluminum on the layer including the refractory metal and in the opening;

after said step of raising the temperature, continuing said step of depositing aluminum, wherein aluminum is deposited at a temperature of between approximately 400EC and approximately 500EC;

during said steps of beginning to deposit aluminum and continuing depositing aluminum, controlling the rate at which aluminum is deposited to allow the deposited aluminum to migrate into the opening so as to provide a substantially complete fill thereof; and

periodically interrupting said continuing step for a first time period.

The examiner relies on the following references:

Armstrong 4,994,162 Feb. 19, 1991

Wolf et al., "Aluminum Thin Films and Physical Vapor Deposition in VLSI", Silicon Processing for the VLSI Era, pgs. 332-334 and 367-374 (1986).

In addition, the examiner relies on admitted prior art [APA][1].

Claims 1, 3-11 and 18-28 stand rejected under 35 U.S.C. § 103 as unpatentable over the combination of Armstrong, APA and Wolf.

All of the claims also stand rejected under the doctrine of obviousness-type double patenting over claim 11 of U.S.

[1] While the examiner indicates the admitted prior art relied upon to be that set forth at page 7, line 16 through page 8, line 2 of the instant specification, this is clearly in error as that part of the specification merely describes the drawing figures. Apparently, the examiner is relying on the description of the prior art which appears at pages 3-5 of the instant specification.

Patent No. 5,108,951.

The claims stand still further rejected, provisionally, under obviousness-type double patenting over claim 15 of copending Application Serial No. 08/418,122.[2]

The examiner also enters new grounds of rejection against all of the claims in the answer but the grounds of rejection are essentially the same ones noted supra.

Reference is made to the briefs and answers for the respective positions of appellants and the examiner.

OPINION

Turning first to the rejection of the claims under 35 U.S.C. § 103, we will not sustain this rejection.

As argued by appellants, the independent claims all require that aluminum is begun to be deposited on the refractory metal layer during the temperature rising step. Armstrong is silent as to any “refractory metal” layer. Further, the aluminum deposited in Armstrong during a

[2] A decision on appeal of the claims in this application was rendered by the Board on November 18, 1998.

temperature rising step is deposited on another aluminum layer which was produced during a first step in Armstrong's process. Since there is no indication that this first aluminum layer may be considered the "refractory metal" layer, as claimed, again, Armstrong fails to teach or suggest the claimed deposit of aluminum on a refractory metal layer, said deposit beginning during the temperature raising step.

While a refractory metal layer may have been well known in the art, as apparently contended by the examiner in referring to admitted prior art, we find no reason, and certainly no reason clearly articulated by the examiner, as to why the skilled artisan would have combined the statements of admitted prior art in the instant specification with the Armstrong disclosure in such a manner as to arrive at the instant claimed invention wherein aluminum is begun to be deposited on a refractory metal layer during a temperature raising step. Wolf, applied as a standard text to show that there is inherent heating during an aluminum sputter deposition process, is of no help in this regard. The claimed temperature raising step entails raising the temperature from below approximately 350 degrees Centigrade to a value between

approximately 400 and 500 degrees Centigrade. The sputter deposition first step in Armstrong is done at a temperature below 200 degrees Centigrade (column 3, lines 12-13 of Armstrong). Thus, we find no connection between the teaching of Wolf and the temperatures required by the instant claims when viewed in light of the sputtering temperature disclosed by Armstrong.

Now, it may be that the first aluminum layer of Armstrong, deposited on a relatively cold surface, might be considered a "refractory metal" so that the aluminum deposited in Armstrong's second step, at higher temperature, may be said to satisfy the claimed requirement of "during said step of raising the temperature, beginning to deposit aluminum on the layer including the refractory metal...". However, among other problems of Armstrong regarding the instant claimed invention, we do not think it is reasonable to call the first layer of aluminum a "refractory metal," as that term is used in the instant application. While, in general, a "refractory metal" would appear to indicate a metal capable of enduring high temperature, with "high" being a relative term subject to much interpretation, "refractories" has been defined by the

Encyclopedia of Chemical Technology[3] as "materials that resist the action of hot environments by containing heat energy...the ability to withstand temperatures above 1100E C without softening has been cited as a practical requirement of industrial refractory materials." It does not appear that aluminum would be in this category of a material which could withstand 1100E C without softening. At page 11 of the Kirk-Othmer Encyclopedia, Vol. 20, it is indicated that the highest-melting refractory metals are tungsten, tantalum and molybdenum. Further, aluminum is not envisioned by the instant application as the claimed refractory metal because that layer would then be subject to the same changes as the aluminum deposited during the step of raising the temperature. It is clear that aluminum cannot constitute the claimed "refractory metal" layer. Thus, the applied prior art does not suggest the claimed step of "during said step of raising the temperature, beginning to deposit aluminum on the layer including the
refractory metal." Thus, we will not sustain the rejection of

[3] Kirk-Othmer, Third Edition, Volume 20, page 1, 1982.

the claims under 35 U.S.C. § 103.

We now turn to the rejection of the claims based on obviousness-type double patenting over claim 11 of U.S. Patent No. 5,108,951 and the provisional rejection of the claims based on obviousness-type double patenting over claims 15 of copending application Serial No. 08/418,122.

We remand the case to the examiner for clarification of the rejections.

The examiner merely contends that the instant application and the patent and/or copending application are "claiming common subject matter" but fails to elucidate. Accordingly, if the examiner maintains these rejections, the examiner is required to specifically and particularly point out how each of the rejected/provisionally rejected claims is found to be obvious over the specifically identified claim limitations of the patent/application, explaining the differences between the instant claimed subject matter and the claimed subject matter in the patent/application and why the instant claimed subject matter would have been obvious thereover.

We further note, regarding the obviousness-type double patenting rejection and provisional rejection, that while the

examiner has fallen far short of a complete explanation of the rejections, appellants' "argument", at page 11 of the principal brief, appears to concede the propriety of the rejections by failing to make any substantive arguments thereagainst, preferring, instead, to merely indicate that appellants have "previously...offered to file an appropriate terminal disclaimer." With regard to the non-provisional double patenting rejection, appellants make no argument whatsoever.

Since appellants have offered to file a terminal disclaimer, obviating these rejections, in the event of allowability of a claim, and we have reversed the rejection of the claims under
35 U.S.C. § 103, should the examiner find the instant claims otherwise allowable, perhaps it would be best for all parties involved if a proper terminal disclaimer is filed. We leave these decisions up to appellants and the examiner. In any event, if no proper terminal disclaimer is filed and the examiner wishes to pursue the obviousness-type double patenting rejections, the examiner is instructed to indicate specific reasons for such rejections, indicating how the

claims of the aforementioned

patent and patent application are being applied against each claim of the instant application.

This application, by virtue of its "special" status, requires an immediate action. See Section 708.01(d) of the *Manual of Patent Examining Procedure*, 6th Edition, Rev. 3, July 1997. The Board should be promptly informed of any action affecting the status of this appeal (e.g., abandonment, allowance, reopening of prosecution).

REVERSED and REMANDED

ERROL A. KRASS Administrative Patent Judge	)	
JOHN C. MARTIN Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JERRY SMITH Administrative Patent Judge	)	

EAK/ki

Richard K. Robinson
SGS Thompson Microelectronic, Inc.
1310 Electronics Drive M S 2346
Carrollton, TX 75006